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Proceedings of the Marine Fisheries Subcommittee Regional Advisory Process Maritimes Region

29-31 March 1999

Keddy's Inn
Dartmouth, Nova Scotia

M.M. Sinclair, Chairman

Department of Fisheries and Oceans
Science Branch, Maritimes Region
Bedford Institute of Oceanography
P.O. Box 1006, Dartmouth
Nova Scotia, B2Y 4A2

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TABLE OF CONTENTS

Abstract/Résumé 4

Introduction 5

4T Herring 5

4VWX5 Herring 9

Concluding Discussion 30

Appendix 1. List of Participants 31

Appendix 2. Invitation Letter 34

Appendix 3. Meeting Remit 35

Appendix 4. List of Documents Tabled 36

Appendix 5. List of Recommendations 38

Appendix 6. Magdalen Islands Effort Control Proposal 39

ABSTRACT

These proceedings record the discussions held during the spring 1999 Regional Advisory Process (RAP) Marine Fisheries Subcommittee meeting on herring. The meeting was held at Keddy's Inn, Dartmouth during 29-31 March, 1999. The management units considered were 4T, 4VWX, and 5Z herring. The proceedings outline the main points of discussion, problem areas and recommendations for further work. Stock Status Reports (SSRs) for the 4T and 4VWX+5Z herring management units were prepared.

RÉSUMÉ

Le présent compte rendu résume les débats tenues durant la rencontre sur le hareng qui a eu lieu au printemps 1999 par le Sous-comité des pêches en mer du Processus consultatif régional (PCR). La rencontre a eu lieu au Keddy's Inn, à Dartmouth, du 29 au 31 mars 1999. Les unités de gestion examinés étaient les zones de pêche du hareng 4T, 4VWX et 5Z. Les actes donnent les grandes lignes des principaux points de discussion, des questions qui posent problème et des travaux futurs recommandés. Des rapports d'état sur les stocks (RES) ont été préparés pour les unités de gestion du hareng 4T et 4VWX+5Z.

INTRODUCTION

The meeting was opened by the Chair, Mike Sinclair, who welcomed the participants. In his introductory remarks, the objectives of the meeting were reviewed. The participants are listed in Appendix 1, the letter of invitation in Appendix 2, the meeting remit in Appendix 3, and the documents tabled at the meeting are listed in Appendix 4. The recommendations made during the meeting are collated in Appendix 5.

4T HERRING

Working Papers: Claytor, R., C. LeBlanc, and C. MacDougall. 1999. Assessment of the NAFO Division 4T Southern Gulf of St. Lawrence herring stocks, 1998. RAP Working Paper 99/09.

Allard, J., and T. Levesque. 1999. Analysis of the relationship between egg availability and recruitment in NAFO Division 4T southern Gulf of St. Lawrence herring stock. RAP Working Paper 99/28.

Rapporteur: Ghislain Chouinard

Remit:

- Conduct an assessment of spring and fall spawners, using previous methods: catch rate analysis and VPA and prepare a Stock Status Report.
- Provide updated 1999 advice for spring and fall 4T fisheries, and preliminary advice for 2000 spring and fall 4T fisheries.
- Conduct an evaluation of target fishing moralities and document in a Fisheries Status Report.
- Evaluate an Adaptive Management Plan based on effort controls for Iles de la Madeleine and document in the Proceedings.
- Examine sharing formulae for fall fishery and document in a Fisheries Status Report.
- Develop methods for deriving local area assessments.

The key points of discussion were the following:

Spring Fishery

1. The fishery has tended to finish earlier in the last 2 years because the quota had been caught quickly.

2. There seems to be fish caught in more areas than used to be. For example, most of the fishery in recent years was prosecuted elsewhere (west P.E.I., SE N.B.) and almost finished by the time it reached Escuminac.

3. It was noted that although there is a high proportion of spring biomass in the acoustic survey in the Baie des Chaleurs, but at the same time the seiner catches and fixed gear catches in that area are low. Spring spawning fish from outside the area are thought to move there to feed.

4. The number of nets is taken into account, but not clear on the depths or the number of meshes.

5. It is noted that the seven year old fish (large year-class) are caught by most nets (whatever the mesh size). It was mentioned that there is more variation in the size of younger fish (ages 3-4).

6. There appears to be a lower CPUE in the last year but it was noted by the industry that the reduction may be caused by the closure of the fishery before the peak. A number of management measures were imposed such as dockside monitoring, tags on nets to ensure that the effort was not exceeded.

7. Concern is expressed that the CPUE in Baie des Chaleurs has been declining to the extent that the catches in that area have been minimal in recent years. There is no data to bring to bear on this issue, but one that needs to be addressed. This is seen as a negative sign.

8. The seiners are suggesting that the fishery in the spring has been later in recent years.

9. A list of positives and negatives on the stock was discussed:
   - Positive: TAC caught; length of fishing season is short; and,
   - Negatives: poor in Baie des Chaleurs; seiner fishery in spring later and with a larger proportion of larger fish.

10. Southeast N.B. fishers indicated that they would like to continue the work that was started in 1997.

11. The results of the telephone surveys were discussed. It was noted that fishers may be more pessimistic because the fishery was closed prior to the peak. It was also noted that the catch rates in the last two years were a bit lower.

12. There is an indication that there are lots of herring in the mackerel fishery. Concerns were expressed that this might eventually lead to closures of the mackerel fishery. There is no biological information to determine with precision whether these are spring spawning herring.

13. Baie des Chaleurs observations suggest that fish tend to come in the Baie later in the summer. The acoustic information tends to suggest a decline.

14. The 1995 acoustic estimates are lower than the two adjoining years. The consistency of these estimates were questioned and discussed in relation to other information. These may show up as residuals in the analysis.

15. ADAPT discussion: Some discussion took place around the fit of the ADAPT model. There were some concerns expressed that residuals for age 4 had a trend and that the most recent years may be over-estimated. There was no apparent explanation for these trends. Retrospective patterns with the method using the FRATIO seem to be better than with method (an assumption) used in the previous year.

16. The ADAPT calibration presented was accepted. This would suggest an $F_{0.1}$ catch in 1999 of 18,500 t.

Fall fishery

1. Observations that fish near Fishermen's Bank are being caught in deeper waters or in the adjoining banks.

2. Discussion focused on the fact that the quota was not reached. It was noted that the quota was reached in some of the areas. Reasons that were cited relating to the fact the quota was not caught; weather was a big factor and in 16B the season was delayed for 1-2 weeks. Despite these observations, there were concerns expressed regarding the fact that the allocation in Chaleurs Bay and of the seiners was not caught.

3. The observations of the fishery in 4Vn were puzzling to many fishers in attendance. The observations were that herring were closer to the bottom and in deeper water in 1998 and not available to the fleet. In general, the seiner representatives felt that the resource is abundant but that the behaviour of the fish appears to have changed and reasons for this change were not apparent.

4. It was recommended that a review of oceanographic information in relation to herring should be done and presented at future herring RAPs. This may help explain such changes in herring behaviour.

5. The age composition from the fishery continues to have large numbers of older fish.

6. Catch rate index: some concerns about the Chaleurs Bay, several comments about why the fishery catch rates might be lower.

7. An analysis including an acoustic index for the fall gave lower population estimates. Essentially the acoustic estimates show a different trend than the CPUE, the model 'splits the difference'.

8. It was noted that both the internal consistency of the acoustic index in terms of tracking year-classes and a comparison of both indices should be examined. It was noted that the CPUE appeared to be consistent.

9. Because of the inconsistencies and the stronger retrospective patterns of the analysis including both indices; it was concluded that the analysis using the CPUE index only should be used.

10. The ADAPT calibrations – tend to overestimate age 4: 1994 was the largest year-class on record. Correction for the retrospective pattern in the estimate of the age 4 would bring the $F_{0.1}$ level from 67,500 t to about 60,500 t.

11. Maintaining stock diversity and ecosystem integrity should be included in the SSR.

Allard/Levesque Paper

1. The presentation suggested that a management strategy that could rely on a combination $F_{0.1}$ and 'escapement' type management could be another option. When the stock biomass falls below the level of biomass where high recruitment is produced, it may be prudent to fish at levels lower than $F_{0.1}$.

2. A number of refinements were identified which could be included in the analysis. These included the incorporation of seiner catches in the calculations of the impact and using actual population estimates of size of spawners. In addition, it was recognized that the most recent estimates from ADAPT may change as more information is obtained.

3. It was noted that the objective was not to predict recruitment but simply to identify biomass levels where good recruitment were produced.

Magdalen Islands Effort Control Proposal

Denis Tremblay presented a short paper, entitled, "Evaluation of an Adaptive Management Plan Based on Effort Control for the Magdalen Islands Herring Fishery" (Appendix 6). The proposal was discussed with interest; however, some concerns were stated with respect to implementation. The following points were made:

1. Current effort levels upon which the effort targets for 1999 would be defined may not be sustainable.

- Although there is evidence that the abundance of herring around the Magdalen Islands is higher than in the early 1990s, the age structure of the Magdalen Islands spring fishery has gone, in the period of a few years, from a fishery with a broad distribution of ages to one which was supported largely by the 1991 year-class in 1997 and 1998, as in the remainder of 4T.

- Calculations of fishing effort over the last three years would need to be based on purchase slip data and average nets used each day as determined from the phone survey. These data would not take into account number of trips made in a day. These, and other aspects of the fishery which cannot be included in the calculations of effort, may lead to under-estimates of current effort. It should be noted that no estimate of the effort targets to be used were presented at the meeting.

2. A good safeguard for the experiment would be to keep the overall 4T spring catch within $F_{0.1}$ levels.

3. The monitoring, validation and accurate reporting of fishing effort will be critical for this experiment. In addition to the monitoring of effort, fishing gear improvements such as the use of larger nets or changes in fishing practices will need to be well documented. It should be noted that technological improvements are often difficult to incorporate in measures of fishing effort.

4. If the experiment is started in the 1999 spring fishery, a thorough analysis of data should be undertaken at the next herring RAP in spring 2000.

It was proposed that these points form the basis of a Fisheries Status Report. However, given the lack of analysis presented to the subcommittee, it was decided after the meeting to put the points in a memorandum to the DG, Gulf Fisheries Management Region.

4VWX+5Z HERRING

Working Papers:

Stephenson, R. 1999. Draft 1999 Evaluation of 4VWX Herring. RAP Working Paper 99/11.

Boates, S.A., and M. Corporon. 1999. Fleet Activity in the 1998 4WX Herring Fishery, 1999. RAP Working Paper 99/12.

Melvin, G., D. Scheidl, J. Fife, M. Power, and R. Stephenson, R. 1999. Evaluation of 1998 Acoustic Surveys, 1999. RAP Working Paper 99/13.

Boates, S.A. and K.J. Clark. 1999. An Analysis of the Seasonal and Annual Variations in Fat Content in the 4VWX Herring Fishery, 1999. RAP Working Paper 99/14.

Harris, L. 1999. Compilation of available information regarding the Scotian Shelf herring spawning component, 1999. RAP Working Paper 99/15.

Reiss, C., C. Taggart, G. Panteleev, B. deYoung, and R. Stephenson. 1999. Ichthyoplankton survey of herring and cod on the Scotian shelf and relation to hydrography and circulation, 1999. RAP Working Paper 99/16.

Clarke, K.J., D. Rogers, H. Boyd, and R. Stephenson. 1999. Questionnaire Survey of the coastal Nova Scotia Herring Fishery, 1998. RAP Working Paper 99/17.

Melvin, G.D., and M.J. Power. 1999. Proposed Acoustic Survey Design for the 4WX Herring Spawning Components. RAP Working Paper 99/18.

Paul, S.D. 1999. Report of the 1998-1999 4VWX Herring and Mackerel Tagging Program and Plans for 1999-2000. RAP Working Paper 99/19.

Harris, L.E. 1999. Exploratory Analyses of Changes in Distribution and Behaviour of herring in Relation to Hydrography on the Scotian Shelf during the 1980s and 1990s. RAP Working Paper 99/20.

Power, M., C. Haycock, M. Geddes, and R. Stephenson. 1999. The August distribution of whale sightings and herring purse seine sets off Brier Island, N.S. RAP Working Paper 99/21.

Harris, L.E. 1999. Incidental Catch in the Herring Purse-Seine Fishery. RAP Working Paper 99/22.

McPherson, A., C. Taggart, D. Cook, and P. Shaw. 1999. Genetic basis for Population structure in Scotia-Fundy Atlantic herring (Clupea harengus) based on microsatellite DNA variability. RAP Working Paper 99/23.

Melvin, G.D., J. Fife, K.J. Clark, M. Power, and R. Stephenson.

1999. Evaluation of the stock status of Georges Bank herring. RAP Working Paper 99/24.

Rapporteur: Kirsten Clark (March 30th) / John Neilson (March 31st)

Remit:

4VWX Herring

- Review and evaluate biological and fishery information, and prepare a Stock Status Report for the 1999 fishery of 4VWX herring, including:
  - I. an analytical assessment of the SW Nova Scotia spawning component
  - II. a review of the Offshore Scotian Shelf spawning component
  - III. a review of Coastal Nova Scotia spawning component, and of the fishery of SW New Brunswick migrant juveniles.

- As part of assessment, review coverage and precision of acoustic surveys

- Review of the biological basis for decision rules used in in-season management and document in a Fisheries Status Report.

5Z Herring

- Review any new information pertaining to the 1999 status of Georges Bank (5Z) herring, and rationalize apparent differences between Canadian and United States statements on resource status. A Stock Status Report is not requested.

Rob Stephenson began the presentation of the 4VWX assessment, giving the background to the division of the area into four different management units and discussing the conservation objectives.

Fleet Activity (RAP WP 99/12)

Susan Boates presented a summary of the fleet activity for 1998.

1. Comment: Timing was different. There wasn't a lot of fish around Spectacle Buoy and the fleet was not active in Scots Bay during a month of peak spawning activity.

2. Question: Was there any difference in the concentration of activity in the White Head area?

- The concentration of activity in the White Head area in the Purse Seine figure was similar to previous years. The closure had no foundation in terms of availability of fish elsewhere.

3. Question: Was there spawning at Seal Island in 1998?
- No.

Acoustic Paper (RAP WP 99/13)

Gary Melvin presented an analysis of the 1998 acoustic surveys.

4. Question: What are these estimates based on?
- Majority of the estimate is based on fishing surveys with only one structured survey on Scots Bay.

5. Question: These estimates do not include the fish from near the American line or the 500,000t from Chebucto Head, so do these fish have no bearing on what the biomass estimates are going to be?
- No. TAC is what is based on our side of the American Line.

6. Question: All signs were positive in 1998 except for a lack of surveys and yet this isn't taken into account for TAC?
- We have chosen to use acoustic surveys as a tally of SSB. That isn't to say that if we saw a million tonnes of fish at some area that we wouldn't take it into account. Schools of herring off the spawning ground are often a mixture, which is why we have chosen to focus on spawning grounds.

7. Question: How did you make the biomass estimates? What statistical methods were used?
- A rectangle is set around it by looking at the sonar, where available, or the outer boundaries of where fish were observed.

  Comment: If you draw a boundary around the school and then cut it into transects and analyze it as if it were a survey, there should be error bars around estimates.
- I have error bars and can put them in.

  Comment: Data collected during fishing excursions is a useful index of abundance.
- They do provide a minimum biomass estimate but you are still missing some fish because others could be fishing on another patch of fish elsewhere.

  Comment: It can be looked at as what one boat saw over a certain number of hours looking. There are ways of looking at these data so that they are indices of abundance.

8. Question: Do you accept that it is an absolute minimum biomass estimate in the way that it has been presented?
- No, I would view it as an index.

9. Question: How does the density of the fish seen off Chebucto Head compare to that of Chedebucto Bay?
- This sort of density was seen in the past in Chedebucto Bay.

10. Question: How about in Bay of Fundy?
- Much less.

Comment: Last year's surveys were the main tool determining size of spawning stocks and the suggested TAC. Almost all processing companies were told not to buy Scots Bay fish because the Japanese would not buy any. That is why there was very little fishing on Scots Bay. You also said in the last sentence of your working paper that there was a 20% increase on German Bank.
- If we hadn't done surveys on German Bank, I might suspect that there were more fish but without surveys, I couldn't say for sure and this was the case with Scots Bay.

Comment: You will be missing small spawning grounds because no one is looking for these fish. If everyone is fishing on German bank, fish are being missed elsewhere. This has to be taken into consideration.

11. Question: What was the biomass off Chebucto Head?
- The maximum was observed on January 22nd and it was 480t.

Comment: If you are looking at fish that are 20-21 cm., this is certainly not something that was surveyed elsewhere. They are probably totally different fish. We would not be double counting them.
- We saw young fish off Chebucto Head. These could have been young fish from the coast of N.S., Scotian Shelf Banks or SW Nova. We have tried to survey more broadly and have overwintering area indices with acoustics but the most successful areas to survey these fish are on the spawning grounds. If we were to see much higher numbers than that elsewhere, we would have to reconsider, but that has not been the case. The observations that we have from the fishery over time are consistent.

12. Question: Why does a large body of fish off Halifax have no bearing on the TAC?
- The 1996 year class is not included in SSB. This is a good sign of recruitment.

13. Question: The numbers you are showing need to be compared to something. Can you compare the number of herring you see now to 10 years ago?
- We didn't have the acoustic gear then.

14. Question: There has been a drastic drop in herring along shore and the whale watchers have seen it too. There used to be a lot of herring there and there are none now. I have talked to all the harbour authorities up to the head of bay and they say the same thing. How many herring do we need to have to have a viable weir fishery?

- Last year one of seiners documented 100,000t off Long Island Shore. The fish can be there and just not in your weirs.

15. Question: Could Mike Power summarize the information on the age structure of fish in the weir fishery now vs. previous years?
- With the increase in aquaculture we have observed less and less fish around Deer Island and St. Andrews Bay. We do a partnership survey every year on Aug. 26th of what weirs have been built and there has been a steady decline. Fish were only bought out of 56 or so weirs in 1998. Our catches aren't the same as 10 years ago. Fishermen I talk to are concerned and they say the fish aren't there anymore. Weir activity is decreasing rapidly.

Evaluation of the Stock Status of 4VWX Herring (RAP WP 99/11)

Rob Stephenson presented the information on the stock status of the SW Nova Scotia/Bay of Fundy spawning component.

16. Comment: We are moving from where we calculated the TAC from a VPA to a series of indicators that are positive and negative and an observed spawning stock biomass. This is a bit experimental.

17. Question: If you just had the 1998 larval abundance index what would you suggest for the Bay of Fundy TAC?
- The model we used would have the 1998 figure as a positive outlier and the population estimate from the VPA would be much lower.

Comment: This is hypothetical. If you were doing a time series you might break it into two so the question can't be answered adequately.

Comment: Regarding the increase in the larval index (LAI), it was suggested the influence of large values of individual station may be a problem. Perhaps the frequency distribution of values from individual sets should be examined to make sure that the value of the LAI is not being skewed. Secondly, it was stated that the age structure was better but, in the data in the summary document does not show an improvement.
- The historical ages for the whole component have not been provided. That is something we should look at.

18. Question: You have gone from a system of guessing to setting TACs only on what you actually see, but there could easily have been another 100,000t of fish in Scots Bay according to the acoustics presentation. Why can't this and other factors, including Chebucto Head, be included?

- The LAI is a legitimate reflection of the overall fortunes of the stock but the VPA has trouble with the fluctuations. I am confident with the integration of all these observations that a TAC of under 100,000t is safe.

  Comment: There are a lot of fish out there which you aren't taking into consideration.
- The Chair has stated that everyone has accepted that 500,000t is a minimum SSB but there appears to be disagreement on indicators.

  Comment: Acoustics are a fantastic way to look at this. It is possible that as we get better information from acoustics the model that we use to arrive at a recommended TAC will be different. Acoustic information needs to be integrated into the assessment and used for bottom line. I would be uncomfortable if we did more surveys and got twice the SSB and then upped the TAC accordingly. We need to go slow in terms of further increases in TAC.

  Comment: The chair mentioned that acoustic surveys represent SSB but many were obtained from fishing expeditions and if you look at the catch at age, a lot of them were not spawners.
- The fish in the acoustic surveys that are used for the SSB are stage 6 almost exclusively. The catch at age is from total catch, much of which is from areas other than spawning grounds.

  Comment: Fishing below $F_{0.1}$ does not mean the stock will recover – eg. groundfish. Herring were thought to be near their lowest level several years ago and whether an $F_{0.1}$ would be appropriate is questionable. Also, if you make a statement about $F_{0.1}$, you need some calculations to support it.

19. Question: There are many positive signs from this fishery: age composition is good, larval abundance is up, 20% increase on German Bank, only surveys on spawning grounds. Given all those positive signs not being generous enough. Only negative is Seal Island (which may be part of German Bank). Could we expect a larger bottom line?

    Comment: Science has agreed that 520,000t is the minimum observed biomass for this year. If all the surveys had been done properly this may have been increased by 20%. If we fish 520,000t at $F_{0.1}$ it will really be less than $F_{0.1}$ because there is likely more fish out there. We shouldn't rush things but a 10 to 20% increase in TAC would not be rushing.

    Comment: I thought that $F_{0.1}$ was 25% rather than 20%. If so, it would mean a 130,000t TAC for 520,000t. If Scots Bay had been surveyed you might have seen 20% more than in 1997 and that would allow 150,000t. I'm not suggesting 150,000t but it does show that 100,000t is very conservative. I would recommend two things:

more structured surveys at specific intervals and that the acoustical numbers be brought forward faster so that we have a running idea of what we see in those areas.

- When it was last looked at $F_{0.1}$ was 20%.

Comment: The Chair noted that we shall continue the discussion about what should be put in the SSR. It was suggested that a list of issues indicating whether things are better or worse be compiled. For 4VWX, the age structure is better this year than last. It might be worth examining average recruitment from historical recruitment information and fishing it at $F_{0.1}$ to see what the age structure would be and whether this agrees with what we see. The geographic distribution of the fishery over the past 5 or 6 years is more representative of the 70s and 80s when the stock had moderate abundance. We can't say if there has been an increase in the SSB from the results of the acoustic surveys but we can consider the results a minimum SSB (although one participant feels it could be an overestimate). The TAC was not caught in 1998 but this was because of market and the restrictions to 20% of the spawning component. Are there other indicators of better or worse?

- Trinity Ledge is not at historical levels and there is an absence of spawning at Seal Island. Larval abundance is up.
- There are positive signs of recruitment of age 2s in catches and in the survey off Chebucto Head.

Comment: Trinity Ledge is a separate issue. It was decimated and we knew it wouldn't recover in one or two years. That is why it is taking so long to recover and shouldn't be lumped with the other stocks.

- It isn't worse than last year but it still needs to be included. The weir situation is not worse than in past two years but perhaps more in the long term.

Comment: There is nothing unexpected from Trinity this year. If you look at catch for weirs on the Nova Scotia side, this has been one of best in ten years.

Comment: One spawning area that fixed gear had been fishing was not as good this year: Spectacle Buoy.

Comment: When you look at NS weirs and removals. Market plays a big role for removals from the Nova Scotia weirs. There used to be a big US market but no longer. This has to be taken into consideration when you look at landings.

Comment: After the German Bank roe fishery was over, 3 seiners were involved in a roe fishery in back of Browns which is new.

Comment: In the inshore the landings are dependent on price and the lobster fishery. When it was a bad year for lobster, fishermen move to gillnetting herring and vice versa. Last year the gillnet effort was at least one third of previous years which should be taken into account for why there are drops in landings from areas like Spec. Buoy.

The Chair thought that the meeting had consensus about positive indicators. The more controversial issue is to what degree should we maintain the status quo re: the TAC. Before lunch some felt we should go slow and hold the line and see what the indicators do and others who felt that this was unduly restrictive.

Comment: I think a simple SPA would give us a better idea of where the stock is going.

- There is a VPA in last year's document which could be used.

20. Question: Are others interested in seeing a VPA run?

- We might want to look at the big picture. Things may be better in relation to 1997 but not necessarily in terms of the long term.

Chair: We could look at 5 or 6 years back, and compare what we have in relation to this.

The Chair thought there was a general consensus on all the indicators. The hard part is to determine what it means it terms of TAC. Half the room says hold the line at less than 100 the rest thinks that there should be an increase.

Comment: If you look at the parameters set last year for the 90,000t level and look at the positives from this year, they don't justify maintaining the 90,000t. There are principles involved. If we are going to set TACs by what we know then we should stick to those principles. We should be fishing at least to the $F_{0.1}$ of what we have actually seen because we know there are more fish out there than we have seen. We don't have a good reason to stick to the conservative 90,000t estimate.

Chair: The age structure shows an improvement but is not ideal. Is it worth having further analysis?

- We have seen the stock increase fourfold in a short period of time so it is possible. I read the signs as saying it is no worse than last year and a few things may have improved, but we should still be concerned with these rates of increase – they could be lower. Maybe there is a middle ground approach where you want to go slow.

Comment: As a caution, from last year's meeting we had some concerns with the VPA. It was included as an illustration only for certain reasons and we should be cautious about using it for anything else.

Comment: It was relegated to an appendix because it didn't hang together and is the reason why we are collecting other information.

Comment: My idea for the VPA was to run one without any index and assuming a terminal fishing mortality and seeing what that gives us. This may be something to consider for next year.

21. Question: If we were to fish at $F_{0.1}$ based on the acoustic number of 520,000t what would that do to our stock a year from now?

- I haven't done a projection. I think it would increase some because of the year-class coming in.

Chair: We are in transition from using a VPA with an $F_{0.1}$ to moving to using the acoustics. I would suggest that Rob try to capture for tomorrow the bottom line of what the indicators have said and capture the difference in points of view represented at this meeting.

Rob Stephenson then presented some Decision Rules for the SW Nova Fishery.

22. Question: Has fishing at 20% over the last 3 years had a negative effect on the stocks? We have positive results so why do we have to change this?

Chair: The logic was that 20% should be taken for the whole year, but fishing also occurs on non-spawners so this is an attempt to try to make the rule consistent with a $F_{0.1}$ harvesting strategy.

- At 20% we can't be sure that we are spreading the load across the spawning components because you can still overfish a spawning component by fishing it in other areas.

Comment: I don't hear any compelling reason to make this change to 10% from Science. Some portion of this stock is being fished before it is being surveyed. What you see on the spawning grounds is the residual after it has been subjected to prior fishing. Those have already been removed. You are not assessing them. It has been admitted throughout all the discussion on acoustics that we are not surveying all of a spawning stock. If you had a totally comprehensive, systematic way of assessing the spawning stocks from the day that they first reproduce to when there is no more spawn evident, then you might be able to do this but our percentage is based only on what we observe. Secondly, a significant portion of fish that are caught before they are on the spawning grounds are prespawners so they are not affected. Thirdly, when the fish around Grand Manan are caught in a weir, they are Gulf of Maine stock but when they move off a mile, they are Bay of Fundy fish yet we count them against the TAC. If we are going to do this, it should be done in a rigorous and logical way. I have seen several spawning cycles in the Bay of Fundy and the Gulf, and the 10 to 14 days is far too long an interval, 5 or 6 is much more likely. So if going to stay with 10 to14, you already have a built in comfort zone. Empirically it looks like the 20% that has been used over the past 2 years is working and the stock is rebuilding and the age structure is improving. Somebody has to give me a much better argument and show

me that we are doing much better book keeping regarding the pluses and minuses before reducing to 10%.

- The intent of the rule is to protect spawning components. Some of the fishing has occurred prior to spawning but also they are being fished after we survey and in the overwintering fisheries.

Comment: You may see 1 million tonnes on spawning grounds but you cannot catch 20% because you are still working with an annual TAC. If you have already caught fish prior to spawning then this counts against the TAC too.

Comment: There is a mixed fishery problem here. We need to know where the 10% is coming from. With the 10 to 14 day interval, I think I agree with you but we need more information.

- We were swayed largely by buildup and drop off of biomass in the acoustic surveys.

23. Question: In the biomass estimates from the acoustics was a 14 day interval used? I see this on Sept. 10th and 18th. What was the third?

- Sept. 30th. There were also some maturity changes that went along with this. I still think we are going largely upon a gut feeling (backed up by some literature and industry). I didn't see enough to change it at this point, although the tagging information is a bit scary.

Comment: From tagging it looks like an interval of at least 10 days although there are a very small number of returns.

24. Question: From the tag returns, do you know if the fish were spent, hard or ripe when they were caught?

- No.

25. Question: Can we get a description of the maturity of the fish when the tag comes back?

- We can try.

26. Question: Was the 10 to 14 day rule applied to the acoustic estimates of SSB?

- Yes.

Chair: It will be necessary to state why 10% vs 20% is an issue. State the reasons for 10% and summarize why this could be restrictive. Essentially stick with the status quo and explain why in theory it could be a problem and why in reality it isn't.

Acoustic Survey Design (RAP WP 99/18)

Gary Melvin gave an outline of a proposed acoustic survey design to permit comparisons between acoustic surveys from year to year.

27. Question: How many kilometers of transects would there be?
- 20 miles. 2 hours per line.

28. Question: How long would it take four boats to survey?
- 4 to 6 hours.

29. Question: What do they do if they see fish?
- They keep going down the transect. It is only if they see no fish on the transect that they can shorten the remaining transects in the survey.

30. Question: Since it is in the best interest of the fishing industry to see all the fish that are out there, wouldn't it be better to have them identify the area of fish first and then have a program that comes up with random transects to be fished?
- If the fleet find a school of fish somewhere else then that doesn't mean there are no fish in the survey area. We need to cover the areas most likely to have spawning fish.

31. Question: Thinking in terms of the distances between transects, if the fish are not there could you miss them?
- The distance between transects is less than sonar range.

Comment: Depending on whether you want an absolute or relative index, you wouldn't have to cover the whole area but could adjust for the area you don't see. You have identified strata where you usually see fish. In other areas you could have transects in a larger box, further apart to cover that there aren't fish there. You might even be able to reduce the number of transects within the main area, perhaps adding some coverage in third strata as well.

32. Question: What is the rationale for the three boxes?
- It is based on the percentage of fish observed.

33. Question: What is cost for industry in doing surveys vs. the compensation that is being offered?
- The time of surveying can range from 2 to 12 hours. They get the same benefit of 50t regardless of the length of the survey.

Comment: The cost of surveying has been calculated to be $7,300 when no fish caught. In terms of compensation of fish, it isn't really compensation at all since it comes out of the quota.

34. Question: Within the defined spawning periods would you assume more than one survey would be done?
- The spawning periods were just used to define the boxes for survey not to define when the surveys would have to be done.

35. Question: What is the protocol then for survey timing?
- 14 days as usual.

Comment: The Chair thought that most people think this is the way to go so we can record this in the proceedings. Dan Lane and Mike Power have done some work on whether the age composition is appropriate.

Comment: A model was used that we have been developing for the OECD committee in Paris. This is one of several case studies looking at economic analysis, management aspects, stock status etc. Strategic biological analysis looks at an approach to equilibrium.

Comment: This gives you some perspective of numbers you might get of age 9,10 and 11 fish. It looks like at equilibrium you would be fishing at about 110,000t.

Comment: You are hypothetically talking about a biomass of 800,000t and fishing only at 110,000t.
- 800,000t is the total biomass, including juveniles.

36. Question: If we saw biomass increasing could we still have a TAC of 150,000t or would it be kept at 110,000t?
- You might want to keep things stable instead of going up and down all the time but if we saw a million tonnes it would be reasonable for the fishery to increase.

Distribution of Whales in Relation to Purse Seine Fishery (RAP WP 99/21)

Rob Stephenson gave an overview of the distribution of whales during August in relation to the herring purse seine fishery off Brier Island. Carl Haycock enlarged on the data that had been collected.

37. Question: There aren't as many whales or porpoises. Have they moved?
- They have moved to a different area such as German Bank or Grand Manan Banks because of a lack of prey.

Comment: I see an increase in right whales since 1995.
- From 1995 to 1997, two thirds of the right whale population has been up in the Grand Manan Basin. They are copepod feeders. This is the same with sei whales. Copepod feeders are moving in whilst herring feeders are moving further out. In 1998 the right whales moved out and in August we saw some herring move in and some humpbacks moved back in (some individual animals that we know haven't been there for 8 years) but then the seining fleet moved in and the numbers decreased again. Water temp. might be affecting the plankton distribution and that will be setting everything off.

38. Question: This paper only looks at one month's data. Had whales been missing all summer or mostly during the month of August?
- Probably both. Whales who would previously stay for a couple of months might just come in and leave or stay just for a few weeks.

39. Question: Later on in the season the seiners are concentrating on German Bank so it would be worth looking at whale distributions at that point.

Comment: You might look at whale data on an effort basis. Secondly you might look at Whitehead and Carscadden's analytical technique for capelin vs. humpbacks. Thirdly, see if you could form a collaboration with seiners to take photos and log whale sightings. Fourthly, I noticed in the data, assuming that whale searchers are as good at finding whales as herring seiners are at finding herring, there is a huge range in the distribution of purse seine catch but much more consistency in the range of the whales. There is a clear contrast in distribution.

40. Question: Are they feeding on juveniles rather than spawners?
- They have preference for smaller herring. There may be a connection with fat content. The centre for Coastal Studies does a circumnavigation of area and found a lot more whales on German Bank this year.

Comment: 1994 was a low fat year but the highest sightings of whales off Brier Island were recorded during that year, so there may be no connection between fat content of herring and whales.

41. Question: Does the increase in number of whale watching boats affect the number of whales seen?
- There are only small numbers of whale watching boats. The biggest whale watching industry is off Cape Cod which primarily watches humpbacks. Whales are very tolerant and haven't been chased off. Statistics don't seem to support that idea.

Comment: The distribution of whales might be a good indicator of juvenile herring so from both angles, wanting to know what the whales are doing themselves plus as indicator for herring, this is worth pursuing.

42. Question: Are there any ongoing studies of krill from BIO that could be incorporated into this?
- There are not a lot of krill studies but there is some information.

Fat Content (RAP WP 99/14)

A presentation on annual and seasonal variations in fat content was given by Susan Boates.

43. Question: How did the methods used by the different plants compare?
- We haven't done the comparisons but we are recommending that they be done. We need to know how valuable this is to industry.

Comment: If you are seeing seasons or years with low fat I suspect it is because there wasn't feed in the area.

44. Question: What benefit does Science get from the information on fat content?
- In 1994 we noticed a dip in fat content combined with the absence of feed and odd water temps. Because fat content has not been a high profile issue recently, it was put on the back burner until last July when the issue was brought up again. If it is easy, it should be done.

Comment: A lot of information could be got from putting the three environmental factors together.

45. Question: Did you include the gain in the weight by age and fat content?
- We put weight at age in the Research Documents but you don't see great variation. With fat data there wasn't sufficient resolution to do more. You are right that we should look into this as well.

Comment: Fat content may be an indicator of condition particularly before spawning, but it might be a trade-off towards producing eggs. Are eggs produced by fat fish more successful than those produced by lean fish? This is the sort of work being done with groundfish at IML.

Comment: In 1994, the fat was under 10% and there was no indication of feed in fish. It was different in 1998 because there was feed. Maybe there is no relationship between fat content and the success of reproduction since 1994 was the year we had the worst fat levels in spawning fish but now we are seeing a good year class of 1994 fish.

Comment: Perhaps the Pelagics Research Council can get plants organized to compare two or three fat methods and also to be consistent with the timing.

Comment: If it can be done efficiently, then information should be collected on fat content.

Population Structure of Scotia Fundy Herring (RAP WP 99/23)

Chris Taggart gave an introductory talk about the contribution genetic analysis can make to the analysis of stock structure. Arron McPherson described the use of microsatellites (type of nuclear DNA) for distinguishing between herring populations.

46. Question: Even if we don't see genetic differences, this is still of interest. No genetic difference doesn't mean that there aren't ecological differences. What are your next steps?
- The next step is to look at offshore samples but currently we are looking at differences between years.

47. Question: Were the differences that you observed between Spectacle Buoy and Emerald Bank as large as those from other species like cod?
- Similar to salmon.

48. Question: Could you distinguish a mixed analysis of Emerald and Spec?
- Need more analysis.

Comment: The more significant the difference, the more powerful would be the discrimination of stock.

Comment: The techniques used in the past were unable to discriminate between Pacific and Atlantic herring.

49. Question: You can use otoliths to get DNA but what kind of treatment do they need?
- They must not be in resin. Ideally you want tissue in ethanol.

Herring Larvae and Physics on Scotian Shelf (RAP WP 99/16)

Christian Reiss presented information from a study funded by PRC and GLOBEC showing the distribution of herring larvae in relation to physical parameters.

50. Question: Your larval tows were oblique so don't know if they were concentrated near the surface.
- They were likely at an isobath at about 60m or so.

51. Question: Are the currents you were showing surface currents?
- Down to 40m.

52. Question: In 1997 there was more connection between offshore and inshore than in 1998. Is this just a function of changing your sampling locations?
- We kept the spatial scale broad enough. Those are probably real changes which have nothing to do with how we sampled.

Comment: Some years there might be more of a connection than others depending upon circulation.
- Yes, but also timing within a year would show just as much variability. The difference seen between within seasons should be as great as between years. To a herring larva that means that where you are depends very much upon when you are spawned.

53. Question: Why are larval herring below the pycnocline?
- They are benthic when eggs so they occur below the pycnocline when they first hatch. The pycnocline is very strong at that time of the year. Those animals would have to swim up against that.

54. Question: Do you have any data from GLOBEC that would support that?
- Yes on capelin but not herring.

Comment: Looking at the 1997 and 1998 figures of larval distribution I see two groups, but you say that there is an interconnection in 1997.
- The flow field is connected.

Comment: There is pretty strong evidence for coastal and offshore spawning.

Information on Scotian Shelf Herring Spawning Component (RAP WP 99/15)

Lei Harris summarized the historical information on Western and Sable Island Bank areas, the October 1998 acoustic survey, the 1996 to 1998 commercial fisheries, the 1997 and 1998 fall icthyoplankton surveys and the July bottom trawl survey.

55. Question: The age distribution for the commercial catch had a broader distribution and wasn't dominated by the 1992 year class was it?
- There was a broad age distribution in 1996, but in 1997 it was not as broad. The 1992 age class was dominant in both those years but in 1996 it was accompanied by older age classes.

Comment: In the past the bottom trawl survey was not considered useful for tracking age classes.
- This is just on the Scotian Shelf and catches have been higher in recent years which makes following age classes easier.

56. Question: From the graphs it looks like spawning extends from mid-September to mid-November. So it is possible that some spawning occurs in September and that it tapers off in November?
- Yes, it is possible. October was chosen as the most likely month.

Comment: If you simply stratified those sites based on flow field, the older animals that spawn in Sept. are coming from inshore. This could be isolated in terms of where they are in relation to the circulation.
- I plotted herring larvae less than 2 weeks of age and there were some outside the survey area but the concentration was in area surveyed.

57. Question: Were spawning fish caught in the silver hake survey?
- Yes, in October.

Comment: If I read the manuscript correctly, the recommended survey area is for the industry assessment. You should reconsider that area. The data shown by Reiss based on sizes etc. shows that there is spawning going upstream of that area. I would extend the survey area to parallel south of Sable. How is a young larva going to get upstream from that box when the flow field is going downstream? In reference to the question of a connection, in December 1992 the herring larvae are well off the bank in the central Scotian Shelf between the bank and coastal current. There was a major storm that year which moved the whole water mass from Western Bank and drove it northward to where those herring were found.

Comment: Regarding the use of trawl surveys, over a million metric tonnes were being taken on Georges Bank at a time (1963 to 1970) when the survey shows nothing. There is something wrong with using the bottom trawl survey for catching herring.

Evaluation of the Stock Status of Georges Bank Herring (RAP WP 99/24)

Gary Melvin presented a summary of his working paper. The following discussion took place.

58. Comment: The Chairman questioned the authors' assertion that the surveys were trending upward. Trend upwards in early 90s, but lots of variability thereafter. Another member of the audience also supported this point.

59. Comment: Clarification requested on whether all survey indices are reflected in the document. Great variability was noted again, perhaps not useful as an index of abundance.

60. Question: Why were the '88-92 age compositions always showing high abundance of age 3?
- Such age structure might occur during a rapid increase in the recovery, and reflect continuous good recruitment.

Comment: In the spring of the year, the majority of GB/NS fish are distributed to the west, and not included in the survey series.

Comment: The question of time of day in the bottom trawl surveys was noted.

Comment: Clarification that Fig. 4 are spring fish only.

61. Question: Have relative proportions of the components comprising the Gulf of Maine management unit remained constant over the 5-10 year period that the fall survey was averaged?

- The senior author of the USA stock assessment noted that a lot of the concerns were management considerations and concerned resource allocations. He reminded the audience that a severe retrospective was found, and supported the idea of using the SSB data from 1995. USA reference biomass levels came from a surplus production model known as ASPIC, not a VPA.

Comment: Concern over bycatch in new fisheries, could there be an impact on groundfish resources that have pelagic early life history stages?

62. The bycatch issue was a concern in the USA. A study monitored midwater trawl and purse seine catches, and found that bycatch considerations were small.

63. Another participant noted that bycatch could be avoided by directing for herring.

64. The assertion was made that survey indices indicate a steady state in the resource. The relative proportions of the stock components may have changed over time. Can the resource be managed separately?

65. The Chairman noted that the RAP would not evaluate the USA assessment. However, it seems clear that the previous Canadian advice is now overly restrictive. There is a requirement for Canada and USA scientists to get together and develop a more complete joint assessment. This view received general support from the floor.

66. Once there is a fishery, Canada will be in a better position to understand the population dynamics of the resource. A moderate fishery will not compromise the targets.

Additional Work Completed During the Meeting

4WX Herring

1. Increase in the larval abundance index from 1997 to 1998 does not appear to the result of just a few large sets.

2. The expected age distribution of a recovered resource was further explored. It was concluded that the current age structure, while improved, is still not optimal and further rebuilding is required.

3. Catch at age in the Nova Scotia stock component was examined and the apparent strength of the 1996 year class commented on.

Major points that were proposed for inclusion in the SSR are identified below in italics, with related questions and comments following:

4. *Trinity Ledge not at historical levels, absence of spawning at Seal Island.*

Question: Why is this relevant, given that positive fisheries have occurred without Trinity Ledge. What is the meaning of historical level precisely.

- Related to the objective of maintaining all spawning components.

5. *Substantial aggregations also documented outside of spawning areas, geographical distribution of summer feeding areas as expected.*

Question: Inshore summer distributions didn't appear normal.

- Chairman noted that the distribution was consistent with periods of similar abundance.

  Supplemental question: Is this consistent with the absence of herring observed in coastal areas (in particular Shelburne County – this was later clarified to be outside of the stock area). One more person still pointed out an absence of fish in NS fixed gear.
- The observation is related to 1994, when distinctive anomalies in inshore distribution were noted.

  Comment: Difficult to document inshore herring distribution because of the absence of data.

Question: It was noted that the overall recorded catch in the SW Nova area is actually higher than the recent past.

- Much fewer weirs now than in the past.

  Comment: There is a need for additional data in the inshore fishery, documented by questionnaire survey.

  Comment: The speaker reminded audience of the whale/herring working paper, which appear to show absence of herring in localized spots.

1999 TAC not caught, but this is attributed primarily to allocations.

Comment: Transfers from fixed gear to mobile were not taken up. Problem was primarily market.

6. *1999 catch should not exceed 100000 t.*

Question: Why so conservative given improved methodology?

- Build up of the fishery should occur in a stepwise fashion.

Comment: Large increase made last year made on less positive signals that what are available now.

Comment: We did miss a lot of fish. At end of the spawning, shorter turnover of fish on the spawning ground. We are being ultraconservative.

Question: Bottom line this year is the same as last year?

- Yes, but subtle difference, this year 100,000 t removals would be consistent with the advice. It was noted that the current assessment precision to discriminate between 100,000 and 105,000 t fishery options.

Question: If we had documented 700,000 t of spawning fish, what impact would that have on the advice.

Comment: There is no real model for how the acoustic information would be used to adjust the TAC.

Comment: There is a danger that we are focusing too much on the figure. How much uncertainty on the biomass estimate, and what about recruitment.

- It was thought that the minimum estimate was probably truly a minimum, and recruitment looked promising.

Comment: Preferred a single number for the TAC not a range.

Comment: The Chairman suggested that final wording could be "If the estimate of 520,000 t is accurate, then removals of 105,000 t would not exceed $F_{0.1}$".

Question: Poor environment, decline in acoustic survey, absence of fish from Spectacle Buoy may make any increases ill-advised.

- The environment in SW Nova does not appear to be negative (fat content work, larval abundance index). The acoustic estimates should not be compared from year to year.

Comment: The age 3 catch upcoming was briefly discussed.

Comment: The Chairman noted the stock is rebuilding, leave it at fishing at something less than 105,000 t.

Scotian Shelf Banks

7. Why take only 5 or 10% here, but 20% in the 4WX.

- New fishery, more uncertainty regarding population dynamics, stock structure, etc.

8. This is too extreme.

- Others have promoted a more extreme approach even than that (ie. No fishery).

- It was pointed out that the harvest rates were consistent with the coastal fishery.

9. Last year, the basis for harvesting was 20%, yet there are positive signs for the resource. Are we being backed into an ecosystem type of approach to the harvesting of this resource without full discussion. This point was reiterated.

   Comment: Slow development of the fishery was promoted from the manager's perspective.

   Comment: This fishery is completely new, targeting only small pieces of it. Could be some double counting, but the fishery only extends over a matter of weeks.

   Comment: Check for vessel changes in the bottom trawl series.

   Comment: The Chairman noted that the need for decision rules was identified, they have been tabled. Industry found them to be overly restrictive, and there was no consensus.

   Comment: Industry was taking a cautious approach regarding this fishery.

   Comment: The Chairman observed that we may be going towards an environment where taking 20% of a forage species is considered excessive.

   Comment: Agreed that there was a need for more surveying on this resource (i.e. Scotian Shelf offshore banks).

Suggestion of a WG dealing with this.

CONCLUDING DISCUSSION

During a short concluding discussion, the focus was on the need for an overview presentation of the ecosystem scale changes that have been occurring during the past decade. Also, it was pointed out that there was a need for discussion of decision rules on developing near-shore fixed gear fisheries with fishers. Restrictive measures were identified in the SSR (i.e. 10% of survey estimates), but there was no discussion. It was pointed out that the schedule for the meeting had facilitated discussion of issues and provided enough time to conduct the reviews. The chair thanked the participants for their active participation during a most interesting meeting.

Appendix 1. List of Participants.

Participant	Affiliation/Address	Telephone	Fax	
Ken Rodman	DFO	(902) 426-6074		Rodmank@mar.dfo-mpo.gc.ca
J.F. Martel	Gaspe Sud	(418) 385-2354	385-3782	
Joanne Cormier	Canadian Ocean	(506) 732-5505	732-3013	
Bobby Baldwin	Canadian Ocean	(506) 732-5505	732-3013	
Brice Hornbrook	Blue Cove Group	(506) 732-2200	732-2220	
Olin Gregan	Miramiche Marine	(506) 627-6016 or (902) 228-2525	(902) 228-2265	
Robert Hache	ASG Inc.	(506) 725-2282	725-5286	robhache@nb.sympatico.ca
Ron Cormier	MFU	(506) 532-2452	533-1006	
Maria Cormier	MFU	(506) 532-9783	532-2487	
Mario Gaudet	MPANB	(506) 726-2400	726-2419	
F.J. Beaudin	MFU	(506) 344-2379	344-2379	
Reginald Comeau		(506) 395-6366	395-1898	emupmmfu@nbnet.nb.ca
Greg Egilsson	Gulf NS Herring Fed.	(902) 485-4415	485-1729	egilsson@north.nsis.com
Bob Crawford	NS Fish.& Aqua.	(902) 863-2521	424-4671	
Don Aldous	Pelagics Res. Council	(902) 757-3915	757-3979	
Earl White	PEIFA	(902) 962-3122	962-3148	
Michael P. Nowinski	Schooner Seafoods Ltd.	(902) 742-8188	742-1160	
Lei Harris	Pelagics Res. Council	(506) 529-8897		harrisle@mar.dfo-mpo.gc.ca
Michael Power	DFO	(506) 529-8854	529-5881	powerm@mar.dfo-mpo.gc.ca
Allen Clay	Femto Electronics	(902) 865-8565	865-8558	aclay@sprint.ca
Ghislain Chouinard	DFO	(506) 851-6220		chouinardg@mar.dfo-mpo.gc.ca
Laurent Paulin	DFO	(506) 851-7790		paulinl@mar.dfo-mpo.gc.ca
Claude LeBlanc	DFO	(506) 851-3870		leblancc@mar.dfo-mpo.gc.ca

Participant	Affiliation/Address	Telephone	Fax	
Gary Melvin	DFO	(506) 529-8854		melving@mar.dfo-mpo.gc.ca
Travis Scheidl	Pelagics Research Council	(506) 529-8854		scheidlt@mar.dfo-mpo.gc.ca
David Vessie	Pelagics Research Council	(506) 548-8555		davidvessie@yahoo.com
E.L. Walters	SCGMB	(902) 637-3276	637-3270	
Ronald Caissie	PEIFA	(902) 854-2743	854-2140	
Kevin MacDonald	Polar Foods Int.	(902) 859-2332	859-3632	hcs@auracom.com
Shelton Barlow	PEIFA	(902) 566-4050	859-2053	
Robert Gallant	PEIFA	(902) 854-2834	854-2140	
Dave MacEwen	PEI Dept. Fisheries	(902) 368-5244	368-5542	
Robert Leard	PEIFA	(902) 853-2575	853-4378	
John Rockford	PEIFA	(902) 853-2048	853-4378	
John Neilson	DFO	(506) 529-5913		neilsonj@mar.dfo-mpo.gc.ca
Roger Stirling	SPANS	(902) 469-8294	469-8294	spans@fox.nstn.ca
Sue Boates	PRC	(506) 529-5973		Boatess@mar.dfo-mpo.gc.ca
Kirsten Clark	DFO	(506) 529-5587		clarkk@mar.dfo-mpo.gc.ca
Denise Rogers	PRC	(506) 543-9224		stephendenice.ross@ns.sympatico.ca
Stacey Paul	Pelagics Research Co.	(506) 529-8854		pauls@mar.dfo-mpo.gc.ca
Jeff Brownstein	MFU, Local 6	(902) 929-2757	929-2299	veronika@ns.sympatico.ca
Paul Blades	Sable Fish Packers	(902) 483-0321	420-0763	paulblades@ns.sympatico.ca
Greg Egilsson	Gulf NS Herring Fed.	(902) 485-4415	485-1729	egilsson@north.nsis.com
Tim Kaiser	Scotia Gamdor	(902) 742-2411	742-1595	scotim@fox.nstn.ca
Stanley Stanton	Fundy Weir	(902) 834-2777	834-2945	
Bob O'Boyle	DFO	(902) 426-3526	426-5435	oboyler@mar.dfo-mpo.gc.ca
Greg Glennis	Connor's Bros. Ltd.	(506) 456-3391	456-1568	
Billy Saulwick	Comeau's Sea Foods	(902) 769-2101	769-3594	
R. G. Stewart	Atlantic Herring Co-	(902) 742-9101	742-1287	

Participant	Affiliation/Address	Telephone	Fax	
	op			
M.P. Mowinski	Schooner Seafoods Ltd.	(902) 663-2521	663-4695	
Sherman d'Eon	ISPANS	(902) 648-2552	768-2418	
David Stevenson	D.F.O.	(207) 633-9530	633-9579	david.stevenson@state.me.us
Ross Claytor	D.F.O.	(506) 851-6249		claytorr@mar.dfo-mpo.gc.ca
Christian Huard	A.P.P.S.G.	(418) 752-2851	385-3782	
Jacques Allard	Universite Moncton	(506) 866-2655	863-2063	mathstat@nbnet.nb.ca
Bobby Baldwin	Can. Ocean Prod.	(506) 732-5505		
Fernard Friolee	Gulf Seiners	(506) 727-7336	727-1118	
Olin Gregan	Seafreez/Miramichi Marine	(902) 228-2265		
Jean Saint-Cyr	FRAPP Inc.	(506) 336-1414	336-1415	frapp@nbnet.nb.ca
Ron Cormier	DFO	(506) 532-2452	533-1006	
Mario Cormier	M.P.M.	(506) 532-9783	532-2487	
Mario Gaudet	MPANB	(506) 726-2400	726-2419	mario@gov.nb.ca
Denis Tremblay	MPO – Laurentienne	(418) 648-5885	649-8002	trer.blden@dfo-mpo-gc.ca
David Belliver	Seafreez	(902) 469-5004	461-9689	
Greg Glennie	Connors Bros. Ltd.	(506) 456-3391	456-1568	
Odile Legare	MAPAQ	(418) 528-2883	643-8820	odile.legare@agr.gouv.gc.ca

Appendix 2. Invitation Letter

Marine Fish Division
Maritimes Region
Science Branch
(TEL: 902 426-4890)
(FAX: 902 426-1506)
(E-mail: sinclairm@mar.dfo-mpo.gc.ca)

Participant (See attached distribution list)

1 March 1999

Dear Participant:

During 29-31 March, 1999, we will be convening a meeting of the Marine Fisheries Subcommittee of RAP to peer review herring resources of the Maritimes Region.

Full assessments will be presented for:

- 4T herring
- 4VWX herring

Also, an update of 5Z herring will be provided. You are invited to this meeting as an external reviewer. We hope to send out the documents to you prior to the meeting. It will be held in the Dartmouth Room at Keddy's, 9 Braemar Drive, Dartmouth, and will start at 10:00 am on Monday, 29 March. Given that only two full assessments are being reviewed it is expected that the meeting will end at noon on 31 March. The remit for the meeting is attached. I would appreciate it if you could confirm your attendance with Rita LeBlanc (506-851-6201).

I look forward to an interesting meeting.

Yours sincerely,

Michael Sinclair
Manager, Marine Fish Division

Attachment

cc:

R. O'Boyle	J. Rice	K. Rodman
D. Rivard	FRCC	R. Vienneau
D. Geddes	J. Neilson	C. Annand
G. Chouinard	J. Loch	L. Poulin
P. Partington	M. Calcutt	R. Stephenson
R. Claytor		

Appendix 3. Meeting Remit.

RAP Marine Fisheries Subcommittee Meeting
29-31 March 1999
The Dartmouth Room, Keddys Motor Inn
9 Braemar Drive, Dartmouth, N.S.

Meeting Remit

4T Herring

- Conduct an assessment of spring and fall spawners, using previous methods: catch rate analysis and VPA and prepare a Stock Status Report.
- Provide updated 1999 advice for spring and fall 4T fisheries, and preliminary advice for 2000 spring and fall 4T fisheries.
- Conduct an evaluation of target fishing moralities and document in a Fisheries Status Report.
- Evaluate an Adaptive Management Plan based on effort controls for Iles de la Madeleine and document in the Proceedings.
- Examine sharing formulae for fall fishery and document in a Fisheries Status Report.
- Develop methods for deriving local area assessments.

4VWX Herring

- Review and evaluate biological and fishery information, and prepare a Stock Status Report for the 1999 fishery of 4VWX herring, including:
  - IV. an analytical assessment of the SW Nova Scotia spawning component
  - V. a review of the Offshore Scotian Shelf spawning component
  - VI. a review of Coastal Nova Scotia spawning component, and of the fishery of SW New Brunswick migrant juveniles.
- As part of assessment, review coverage and precision of acoustic surveys
- Review of the biological basis for decision rules used in in-season management and document in a Fisheries Status Report.

5Z Herring

- Review any new information pertaining to the 1999 status of Georges Bank (5Z) herring, and rationalize apparent differences between Canadian and United States statements on resource status. A Stock Status Report is not requested.

Appendix 4. List of Documents Tabled.

Allard, J., and T. Levesque. 1999. Analysis of the relationship between egg availability and recruitment in NAFO Division 4T southern Gulf of St. Lawrence herring stock.. RAP Working Paper 99/28.

Boates, S.A., and M. Corporon. 1999. Fleet Activity in the 1998 4WX Herring Fishery. RAP Working Paper 99/12.

Boates, S.A., and K.J. Clark. 1999. An Analysis of the Seasonal and Annual Variations in Fat Content in the 4VWX Herring Fishery. RAP Working Paper 99/14.

Clark, K.J., D. Rogers, H. Boyd, and R. Stephenson. 1999. Questionnaire Survey of the coastal Nova Scotia Herring Fishery, 1998. RAP Working Paper 99/17.

Claytor, R., C. LeBlanc, and C. MacDougall. 1998. Assessment of the NAFO Division 4T Southern Gulf of St. Lawrence herring stocks. RAP Working Paper 99/09.

Harris, L.E. 1999. Compilation of available information regarding the Scotian Shelf herring spawning component. RAP Working Paper 99/15.

Harris, L.E. 1999. Exploratory Analyses of Changes in Distribution and Behaviour of herring in Relation to Hydrography on the Scotian Shelf during the 1980s and 1990s. RAP Working Paper 99/20.

Harris, L.E. 1999. Incidental Catch in the Herring Purse-Seine Fishery. RAP Working Paper 99/22.

McPherson, A., C. Taggart, D. Cook, and P. Shaw. 1999. Genetic basis for Population structure in Scotia-Fundy Atlantic herring (Clupea harengus) based on microsatellite DNA variability. RAP Working Paper 99/23.

Melvin, G., D. Scheidl, J. Fife, M. Power, S.A. Boates, and R. Stephenson. 1999. Evaluation of 1998 Acoustic Surveys. RAP Working Paper 99/13.

Melvin, G.D., J. Fife, K.J. Clark, M. Power, and R. Stephenson. 1999. Georges Bank (5Z) herring 1999 overview. RAP Working Paper 99/24.

Melvin, G.D., and M.J. Power. 1999. Proposed Acoustic Survey Design for the 4WX Herring Spawning Components. RAP Working Paper 99/18.

Paul, S.D. 1999. Report of the 1998-1999 4VWX Herring and Mackerel Tagging Program and Plans for 1999-2000. RAP Working Paper 99/19.

Power, M., C. Haycock, M. Geddes, and, R. Stephenson. 1999. The August distribution of whale sightings and herring purse seine sets off Brier Island, N.S. RAP Working Paper 99/21.

Reiss, C., C. Taggart, G. Panteleev, B. deYoung, R. Stephenson, and M. Power. 1999. Ichthyoplankton survey of herring and cod on the Scotian shelf and relation to hydrography and circulation. RAP Working Paper 99/16.

Stephenson, R. 1999. Draft 1999 Evaluation of 4VWX Herring. RAP Working Paper 99/11.

Appendix 5. List of Recommendations.

4T Herring

- It was recommended that a review of oceanographic information in relation to herring should be done and presented at future herring RAPs.

4VWX Herring

- There is a need for additional data in the inshore fishery, documented by questionnaire survey.
- There is a need to improve and standardize the acoustic survey protocol as suggested in the working paper presented by Melvin *et al.*

Appendix 6. Magdalen Islands Effort Control Proposal

Evaluation of an adaptive management plan based on effort control for the Magdalen Islands herring fishery

D. Tremblay

Introduction

Prior to the collapse of the 4T herring fishery in the early 1980s, a major herring fishery, was occurring around the Magdalens. Landings ranging from 15 000 to 21 000 tonnes were made both by the seiner fleet operating at that time and through an important fixed gear fishery (gillnets and traps).

The spring fishery rebounded everywhere but in the Magdalens in the early 1990s. In the last 4 years, landings increased progressively to reach close to 2 000 tonnes in the spring of 1998. The new management regime allocates quotas to local areas based on recent catch history.

There is evidence that local abundance is on the rise. For example, the major spring spawning ground in the Islands, the Grande Entrée lagoon, is used again by herring schools. A day of fishing in 1998 yielded landings over 400 tonnes from that spawning ground alone. The fishery was closed the following day, the quota having been overrun.

Methodology

Because Science is currently unable to assess local abundance in the southern Gulf, an alternative management regime is proposed. This regime could be in place until such time as we acquire sufficient knowledge to effectively assess local abundance.

The proposal involves the daily monitoring of both catches and effort (net-days) through dockside monitoring and with at sea verifications.

Our targets would be the current quota coupled with the effort needed to catch that quota based on an average of recent (3 years) effort to effectively land that amount of fish.

If the quota is caught before the effort level is reached, we would allow the fishery to continue until the effort target is reached.

If the effort level is reached prior the catch of the quota, we would close the fishery.

Discussion

That method allows more flexible management in the absence of an effective assessment of local abundance.

The risk of overexploitation should be limited by capping the effort to recent levels. If the herring resource is there in abundance that should allow for more fish to be landed and if abundance is declining that method would allow for early closure, thus protecting the stock.

That regime would be in place temporarily until such time we are able to effectively assess local abundance. Also, if proved successful, that regime could be used elsewhere in the southern Gulf.